VIA EFS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of: Yoshiaki Tanaka		:		
Conf. No.:	4884	:	Group Art Unit:	1742
Appln. No.:	10/654,099	:	Examiner:	Jessee Randall Roe
Filing Date:	September 3, 2003	:	Attorney Docket No.:	10844-31US (203055(C-1))
Title:	ALLOY TYPE THERMAL FUSE AND MATERIAL FOR A THERMAL FUSE ELEMENT			

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

This is in response to the Notification of Non-Compliant Appeal Brief dated October 31, 2008 in the above application. As set forth in the Notification, Appellants' Brief filed October 26, 2007 is deficient because it does not separately map independent claim 4 to the specification.

This response is being submitted to correct the Appeal Brief's Summary of Claimed Subject Matter and is being timely filed by November 30, 2008.

Attached is corrected Section V, which maps independent claim 4 to specific paragraphs of the specification and is now in full compliance with 37 C.F.R. § 41.37. Prompt consideration by the Board is respectfully solicited.

Respectfully submitted,

YOSHIAKI TANAKA

November 5, 2008 By: /Sandra M. Katz/
(Date)

SANDRA M. KATZ
Registration No. 51,864
PANITCH SCHWARZE BELISARIO & NADEL LLP
One Commerce Square
2005 Market Street, Suite 2200
Philadelphia, PA 19103-7013
Telephone: 215-965-1310
Direct Dial: 215-965-1344

Facsimile: 215-965-1331
E-Mail: skatz@panitchlaw.com

SMK:smk

Encl: Substitute Section V of Appeal Brief in Application 10/654,099

SUBSTITUTE SECTION V TO APPEAL BRIEF IN APPLICATION NO. 10/654,099

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed invention relates to alloy type thermal fuses and materials for thermal fuse elements (see, Appellant's Specification ("Spec"), ¶ [0001]). As recited in claim 3, these alloy type thermal fuses and materials contain particular ternary alloy compositions having more than 46% to 70% Sn, 18% to less than 48% In, and 1% to less than 12% Bi, all percentages being by weight (Spec., ¶ [0012]). In one embodiment, as recited in claim 4, 100 weight parts of this alloy composition are combined with 0.1 to 3.5 weight parts of Ag, Au, Cu, Ni, Pd, Pt, Sb, Ga, and/or Ge (Spec., ¶¶ [0012] – [0013]). As recited in claims 3 and 4, the alloy compositions do not contain any elements whose use is prohibited due to harmful effects on living bodies (Spec., ¶ [0004]). The thermal fuses according to the presently claimed invention thus achieve the goal of environmental conservation by protecting both individuals involved in the manufacturing of the thermal fuses and the end-users who handle them.

Alloy type thermal fuses and fuse elements having the claimed elemental compositions were developed by Appellant as a result of intensive study in order to provide a fuse having a narrow operating temperature range and excellent overload and dielectric breakdown characteristics (Spec., ¶ [0026]). Alloy type thermal fuses according to the invention may have the fuse element connected between lead conductors and optionally sandwiched between insulating films. In one embodiment, at least a portion of each lead conductor bonded to the fuse element is covered with a Sn or Ag film (Spec., ¶¶ [0017] and [0022]).

In fuse elements having alloy compositions with a solid-liquid coexisting region (between the solidus and liquidus temperature), there is a possibility that the fuse element will be fused off at an uncertain temperature in this region. A wide coexisting region thus results in a wide operating temperature range of the fuse. Consequently, in order to reduce this dispersion of operating temperature, an alloy having a narrow solid-liquid coexistence region, and ideally a eutectic composition, may be utilized so that the fuse

element fuses off at approximately the liquidus temperature (which is equal to the solidus temperature in a eutectic composition) (Spec., ¶ [0003]).

A variety of ternary Sn-In-Bi alloys are known. As shown in the liquidus projection diagram in Attached Appendix B (previously filed with the Request for Reconsideration dated December 21, 2006), these alloys have a binary eutectic point at 52In-48Sn (point E1) and a ternary eutectic point (point E2) at 21Sn-48In-31Bi. The binary eutectic curve, which elongates from the binary eutectic point toward the ternary eutectic point, passes through a region having 24-47% Sn, 50-47% In, and 0-28% Bi (Spec., ¶ [0006]). Alloy compositions in regions separated from the binary eutectic curve have wider solid-liquid coexistence regions, which may possibly widen an indefinite region of temperatures at which the fuse element fuses off and also increase the dispersion of the operating temperature of the thermal fuse. Accordingly, these regions have not traditionally been investigated for suppressing the dispersion of operating temperature range by narrowing the solid-liquid coexistence region.

However, by studying a variety of Bi-Sn-In alloys having different compositions and measuring the DCS (differential scanning calorimetry) profiles thereof, Appellant has surprisingly found that when an alloy composition in a specific region which is separated from the binary eutectic curve is used as a fuse element, the resulting fuse element can be concentrically fused off in the vicinity of the maximum endothermic peak. Excellent overload and dielectric breakdown characteristics are thus obtained. Appellant has thus discovered a specific ternary In-Sn-Bi alloy composition, usable for a fuse element, which is suitable for environmental conservation and which provides excellent overload and dielectric breakdown characteristics and a narrow operating temperature range (Spec., ¶ [0026]).

The alloy composition in this region, which is separated from the binary eutectic curve, has a wide liquid coexistence region and a single maximum endothermic peak. Accordingly, the dispersion of the operating temperature of the alloy thermal fuse may be controlled. Moreover, in the alloy composition, the total amount of In and Sn, which have relatively smaller surface tensions, is larger than the amount of Bi, which has a larger surface tension. Therefore, the wettability of the solid-liquid coexisting at the maximum endothermic peak is sufficiently improved, even before the completion of

liquification, so that spheroid diversion of the thermal fuse element can be performed in the vicinity of the maximum endothermic peak. Consequently, the dispersion of the operating temperature of the thermal fuse can be reduced (and set to be within a range of ± 5° C). The holding temperature of such thermal fuses (20° C less than the operating temperature) may be less than or equal to the solidus temperature, which is desirable. Further, due to the relatively large percentages of In and Sn in the alloys, fuse elements having sufficient durability to be drawn into thin wires, such as 200 to 300 μmφ, can be achieved (Spec., ¶ [0026]).

Appellant has further found favorable results from utilizing a fuse element having the claimed alloy composition, which is in a range having a wide solid-liquid coexistence region and is separated from the peripheral region of the binary eutectic curve whose solid-liquid coexistence region is narrow. That is, using such an alloy avoids problems resulting from a narrow solid-liquid coexistence region. Namely, the alloy during energizing and temperature rise is instantly changed from solid to liquid, which causes an arc to be easily generated during operation. The resulting local and sudden temperature rise causes vaporization of the flux, and raises the internal pressure or chars the flux. In addition, the molten alloy or the charred flux is intensely scattered. Due to these occurrences, physical destruction, such as crack generation due to local and sudden internal pressure rise, or reconduction between charred flux portions, easily occurs during operation. Insulation distance is thus shortened and dielectric breakdown results. The wide solid-liquid coexistence region which is exhibited by the present invention will eliminate these undesirable characteristics (Spec., ¶ [0026]).